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TITLE: Method and apparatus for enabling real time monitoring
and notification of data updates for WEB-based data
synchronization services

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Brief Summary Text - BSTX (5):
   The most usual network appliance used for navigating the Web and downloading
data therefrom is the personal computer (PC). More recently however, a host of
other electronic communication devices have been adapted for network connection
and navigation on the Internet. Some of these better known devices include
cellular telephones, personal digital assistants (**PDA's**), pagers, and notebook
and laptop computers. Some types of these appliances access the Internet via
wireless connection. In other cases, data from the Internet is transmitted to
such devices through a gateway to a network specific to the device. An example
would be that of a cellular phone or pager capable of accessing e-mail and
other Internet accounts information.

Brief Summary Text - BSTX (7):
   Even with the more powerful and traditional PCs and notebook computers there
may be times when available bandwidth suddenly drops resulting in a disconnect
or "moof" as it is often termed. If a moof occurs when attempting to download
data, another attempt must be made to reaccess the network, re-navigate to the
data source, and attempt a retry of the data download. This can be frustrating
for users operating such devices as cell phones, pagers or **PDA's** which are
already operating on high latency and/or low bandwidth connections.

Brief Summary Text - BSTX (8):
   Administrators of network equipment and connection architecture as well as
companies that host such as WEB-based information services and the like are
improving aspects of communication with various portable network devices by
upgrading lines and equipment, developing better data compression and bandwidth
reservation techniques and lobbying for more bandwidth for wireless
intermediary networks. However, one area that has been largely overlooked is
the very **format** and structure of data that is transmitted. For example, HTML
or XML-scripted content is largely unsuitable for transmission under low
bandwidth conditions to small portable devices. As a result, such devices
having lower memory and operating under lower bandwidth resources are limited

to certain types of data such as only e-mail or voice mail.

Brief Summary Text - BSTX (10):
   The data obtained by the above-described method is stored in a
server-accessible data repository for user access (via PC), or pushed to a user
(PC or alternate appliance) according to enterprise rules. The data is
typically presented in the form of a WEB page made accessible to a user having
suitable equipment for retrieving and viewing such a page. However, in another
embodiment, the data is re-formatted for transmission to a user-specified
Internet appliance such as a cell phone, laptop, **PDA,** etc. The user must
typically first access the service using a device that supports a browser
interface. Data is then forwarded to alternative devices only on user request,
and assuming the user has configured his or her alternative device for the
service. In order to receive some types of data, special software and/or
hardware changes must be made to the alternative appliances.

Brief Summary Text - BSTX (11):
   The above service does not support independent device access to the Internet
(except for devices already capable of browser navigation), nor can it deliver
certain content retrieved in a **format** that is not readily convertible to a
format specific to the software running on such alternative devices. Moreover
much content that would be convertible may still overload the memory of certain
alternative devices, such as pagers or cell phones, if additional data
restructuring and synchronization steps are not taken.

Detailed Description Text - DETX (11):
   As previously described, main server 33 is also connected to modem bank 29
as is known in the art of landline Internet access through an ISP. A personal
computer (PC) 45 operated by a user/subscriber to the service of the present
invention is illustrated as connected to modem bank 29 by an Internet
connection line 49. Line 49 may be a conventional telephone line, an
integrated digital services network (ISDN) connection line, or any other
suitable wired connection such as ADSL. A **PDA** 47 is illustrated by a dotted
double arrow as having a wireless communication link to PC 45 as is common in
the art of computer peripherals.

Detailed Description Text - DETX (21):
   In another aspect of the present invention, requests and return data may be
registered and received by a user operating a **PDA such as PDA** 47, which is a
peripheral to PC 45 illustrated as wired to Internet 11. In this embodiment, a
user operating **PDA** 47 registers a request to PC 45. The request is analyzed
and uploaded to server 33 under control from **PDA** 47. Additional processing
concerning obtaining and returning information is the same as with previously
described embodiment except that instead of using data center 37 as an
interface, PC 45 acts as the interfacing machine. If requested data arrives to
PC 45 in a **format** that is not discernable to **PDA** 47, then data restructuring
may be performed in PC 45 by a provided instance of SW 51 that is dedicated to
the purpose. **PDA** 47 would require no modification in either hardware or
software. In yet another embodiment the client machine may be PC 45.

Detailed Description Text - DETX (22):

The method and apparatus of the present invention provides a unique capability of restructuring data in an intelligent way. That is, instead of simply converting one **format** of data into another, a first data set is analyzed and understood so that an alternate data set in a **format** specific to applications executable on a receiving device may be created that reflects the desired content and function of the first data set. More detail about how this is accomplished is provided below.

Detailed Description Text - DETX (26):

Instead of simply converting data from one language or **format** into another in an attempt to render it usable to a specific Internet appliance, the present invention seeks to rewrite original data in an alternate **format** or language that accurately represents the data presented in the original **format** in terms of content and function. Data expressed in this alternate **format** (standardized) is then restructured into the appropriate device-specific **format** for transmission.

Detailed Description Text - DETX (27):

To accomplish the above-described task, it is required that data obtained in layer 53 be at least machine-legible in its given language or **format** and understood by software 51. SW 51 must also know parameters encompassing the **formats** and data presentation schemes of various software routines used in various Internet-capable appliances. For example, an HTML description of a flight reservation and gate instruction as presented on an information page (WEB page) would not be expressed as a text block in such as an electronic calendar, or a **PDA**. Rather, the same information would have to be restructured and expressed as a series of entries expressing time and date functions associated with the particular flight schedule.

Detailed Description Text - DETX (28):

In a preferred embodiment, an algorithm is employed as part of software 51 that can take information from provided input data-templates and restructure the information to fit pre-designed and associated output data-templates. For example, an input template is created for one or more records of network-based data. The input template renders the original data into a proprietary language similar to HTML and XML. The proprietary language or code expresses the original data in a standard **format** that may then be manipulated by algorithm. The input template holds the rendered data according to mapped slots.

Detailed Description Text - DETX (30):

Data templates as described above, are not analogous to logic templates described in the co-related application Ser. No. 09/323,598. Data templates work in conjunction with scripted logic-templates used to find and parse the requested data. Input templates are request-generic while output templates are device-generic. For example, there are many variations of data **formats** and languages that can be used when presenting data on a WEB page. Therefore, an

input template should be modeled to facilitate the specific data fields, language, and **format** in which requested data is expected to be found. In some cases, an input template may be enhanced to support a variety of differing **formats** and or languages, and be made to hold more slots for data not necessarily requested. The output template is device generic and contains only usable data-slots that may be presented on its associated device.

Detailed Description Text - DETX (34):

Component layer 55 includes an interfacing data center such as data center 37 represented in FIG. 1 and a desktop PC such as PC 45 of FIG. 1. Output templates contain device specific data that is ready for transmission to target devices such as devices 39-47 of FIG. 1. As output templates are completed, they may be held for requesting users at a storage facility (not shown) held in a data center, or pushed to requesting users based on the original request. Similarly, output records destined for such as Internet-connected PCs may be held therein for remote access, or pushed to requesting users operating peripherals such as **PDA** 47 of FIG. 1.

Detailed Description Text - DETX (35):

Component layer 57 represents various network capable appliances as described above and their associated transmission networks. Illustrated within layer 57 is a **PDA** with a remote (wireless) link to PC in layer 55 as shown by double-arrow connecting line. Also illustrated within layer 57 is a pager, a notebook, and a mobile phone, all having remote (wireless) connections to the data center represented in layer 55 as shown by the double-arrow connecting lines. The PC illustrated in layer 55 may be a desktop PC operated by one or more users. In another embodiment, it may be a powerful workstation shared by many users. The represented data center has all of the interface means required to bridge the appliances of layer 57 to the service.

Detailed Description Text - DETX (39):

FIG. 3 is a block diagram illustrating client request/result loop progressing through the various process phases of the service of the present invention in a preferred embodiment. In step 57 a client (user/subscriber) initiates a request for data. Such a request may be initiated from a network capable appliance like appliances 39-43 of FIG. 1. A client may also initiate a request from a standard PC such as PC 45 of FIG. 1, or a **PDA such as PDA** 47 of FIG. 1. Browser software of any sort is not required for a device to access the service. In this way, a low bandwidth device may be used to practice the present invention without depending on a parent or associated machine. For example, devices not having IP capability or navigational software would interface with such as data center 37 of FIG. 1 in order to gain access. Appropriate equipment and means for bridging networks is made available in data center 37. An Internet-capable appliance having a browser function and Internet connection capability may, of course, gain access through normal wired or wireless channels.

Detailed Description Text - DETX (40):

In step 59, a request from a client is registered to the service. If the

request is initiated from a device using a wireless network wherein a data center such as center 37 is the interface, then the request data may be **converted from the protocol** used by the requesting device to a suitable **IP** protocol for registering at a server such as server 33 in ISP 15 (FIG. 1). If an Internet-connected PC or workstation is the interface, and a requesting device is a remote peripheral such as **PDA** 47, then the original request will arrive already in suitable IP **format**.

Detailed Description Text - DETX (43):
    In step 67, all data obtained in step 63 is aggregated and tagged according to a user-specific and device specific manner. In some cases the data found during navigation is simply stored in one location for a client with the stored data retaining it's original **format**. In another case, data is rendered to an intermediate form of it's original language for the purpose of providing a standard **format** from whence further re-structuring may occur.

Detailed Description Text - DETX (44):
    In step 69, aggregated data is restructured from its original **format** (if applicable) to it's final **format** (device specific) in preparation for transmission. In other cases, the data is stored for client access at his or her convenience. In a preferred embodiment, the above-described template method with algorithm is used. In an alternative method, a knowledge base technique is used. In still another embodiment, the two methods may be combined. It is assumed that by the time data restructuring occurs, an input and an output template containing the appropriate data fields pertaining to a target device have been provided. A software module (not shown) termed a data renderer converts the original data in aggregation into a suitable intermediary language that is understood to be standard to the system and compatible, in terms of further slot-mapping, according to any supported protocols specific to various network appliances interacting with the service. The intermediate language may be of a proprietary nature and licensed to other entities for use. In an embodiment wherein a knowledge base system is used, an intermediate language would not specifically be required.

Detailed Description Text - DETX (46):
    In one embodiment, output templates may be provided with additional functional routines (based on the content of inserted data) that may be caused to activate a notification system or the like that is generic to a particular receiving device. For example, a round trip flight description may be rendered as a series of appointment book entries in such as a **PDA**. The additional notification routine in the output template may, according to the data, set an alarm or other audible alert to activate at a convenient time before the scheduled departure, as a reminder to the user.

Detailed Description Text - DETX (58):
    In some cases, data is not simply aggregated for a user, but processed and delivered to a user immediately if a user has directed the service to do so. This case is represented herein by the bracketed directional arrow emanating from software 76, bypassing database 87, and progressing toward a data

restructuring software 89. Data restructuring software 89 is analogous to software layer 55 of FIG. 2. Software 89 is responsible for restructuring and re-mapping aggregated or source data into **formats** that are specific to portable devices designated by users to receive the data such as those illustrated in FIG. 1. For the purpose of the present invention, however, monitoring and notification applies more specifically and most often to data that is held in aggregation for a user.

Detailed Description Text - DETX (68):

In other embodiments, a user may request that notification be sent to any one or a combination of a variety of portable devices that are configured to the service. In this case, module 85 passes the notification event to software 89, which interfaces with such as data center 37 of FIG. 1. Software 89 then restructures and re-maps the notification event for delivery to a specified device such as devices 39, 43, and 41 of FIG. 1 over suitable networks. This assumes that a notification event comprises at least summary data describing the nature of the data changes and where to access such changes. In this regard, an Input template similar to one described in FIG. 2 above is used as well as an output template associated with the **format** of the receiving device (if required). Software 89 restructures the notification data for delivery as it would for normal data synchronization.